ABSTRACTS OF THE PROCEEDINGS

OF THE

GEOLOGICAL SOCIETY OF LONDON.

No. 273.] [Session 1873–74.

November 19, 1873.—Prof. Ramsay, F.R.S., Vice-President, in the Chair.

Henry Francis, Esq.,, Accountant of Santo Domingo, Chontales, Nicaragua; and the Rev. J. T. Campbell Gullan, of Uplands, Swansea, were elected Fellows of the Society.

The List of Books presented to the Library was read; it included the following:—F. J. Pictet's "Matériaux pour la Paléontologie Suisse," 6e série, Livr. 7–10; Dr. Dawson's "Report on the fossil Plants of the Lower Carboniferous and Millstone-Grit Formations of Canada;" and Dr. Beke's "Mount Sinai a Volcano."

The following communications were read:—

1. "Supplemental Note on the Anatomy of *Hypsilophodon Foxii*." By J. W. Hulke, Esq., F.R.S., F.G.S.

The material for this note was a slab from Cowleaze Chine, containing portions of two individuals of *Hypsilophodon Foxii*, one consisting of a skull with a great part of the vertebral column, the other of a portion of the vertebral column. The author described some details of the structure of the skull, and especially the palatal apparatus. The pterygoids, which are not mesially joined, have a stout body, the posterior border of which bears a very large basisphenoidal process, and the left pterygoid retains the root of a strong quadratic process, in front of which the hollow outer border runs out into an ectopterygoid. In front of the pterygoids the palatines are partially visible, also separated by a fissure. Of the eight vertebræ, the three last are firmly anchylosed, and the seventh and eighth form part of the sacrum. They are constricted in the middle, and their transverse processes, which spring from the junction of two vertebræ, are bent backwards, joining the dilated outer end of the transverse processes of the next vertebra, including a large subcircular loop. The second fragment of a vertebral column, which belonged to a smaller individual, includes the sacrum and several vertebræ. Near the skull the slab contains several very thin bony plates of irregularly polygonal form, regarded by the author as dermal scutes. In connexion with the question of the generic rank of *Hypsilophodon*, the author stated that in *Hypsilophodon* the

centra of the sacral vertebræ are cylindroid and rounded below, whilst in *Iguanodon* they are compressed laterally and angulated below.

Discussion.

Mr. Boyd Dawkins thought there was as much distinction between *Hypsilophodon* and *Iguanodon* as between *Hipparion* and *Equus*, and that this was quite sufficient to be regarded as generic rather than specific. He was not satisfied as to the additional bone in the foot in Mr. Beeles's specimen, but thought it might belong to some other part of the animal. He did not accept the received view as to the character of the upper teeth of *Iguanodon*.

Mr. Seeley considered that the author was likely to substantiate his opinions. He pointed out certain differences in the structure and form of the maxillary and other bones of the skull in *Hypsilophodon* and *Iguanodon*, and especially in the maxillary. He attached great importance to the thickening of the enamel at the base of the teeth of *Hypsilophodon*, which approximated to that which was found in some mammals. The teeth commonly reputed to be those of *Iguanodon* might he thought belong to different species, if not genera, and showed some divergence in character. The observations on the palatal bones of *Hypsilophodon* were, he thought, calculated to throw great light on the anatomy of Dinosaurs.

2. "The Drift-beds of the North-west of England.—Part 1. Shells of the Lancashire and Cheshire Low-level Clay and Sands." By T. Mellard Reade, Esq., C.E., F.G.S.

The author commenced by explaining a section in a cutting at Booth Lane Station, in which most of the beds seen about Liverpool are typically represented. This section shows in ascending order:—1. Pebble-beds of the Trias; 2. shattered rock; 3. compacted red sand rubble (ground moraine); 4. lowest bed of Boulder-clay (largely composed of red sand); 5. stratified sand, with shell-fragments; 6. bed of fine unctuous clay; 7. brick-clay (with many shells); 8. sand-bed; 9. stratified yellow sand ("Washed Drift sand").

The author next gave a list of the localities in which shells were found, and stated that in all forty-six species had been met with distributed through the clay-beds, those found in the sand-seams being rare and generally fragmentary and rolled. The shells most commonly found entire are usually of small size, and of a form calculated to resist pressure,—such as *Turritella communis*, *Trophon clathratus*, and *Mangelia turricula*. *Fusus antiquus* and *Buccinum undatum* are generally represented only by worn fragments of the columella, and *Cyprina islandica* is always found in fragments. The author thought that the association of the various species distributed without order through the clays shows that they could not have lived together on the same bottom, but that they must have been to a great extent transported. He contended that the admixture of shells in the Boulder-clay was due to the tendency of the

sea to throw up its contents on the beach, whence changing currents and floating ice might again remove them, and to the oscillations of the land bringing all the beds at one time or another within reach of marine erosive action. He maintained that it is in the distribution of land and sea at the period of deposition of the Lancashire deposits, and not in astronomical causes, that we must seek the explanation of the climate of that period, the conditions of which he endeavoured to explain by a consideration of the proportions of the species and the natural habitats of the shells found in the drifts.

3. "Note on a deposit of Middle Pleistocene Gravel near Leyland, Lancashire." By R. D. Darbishire, Esq., F.G.S.

The bed of gravel, about 40 feet thick, and about 240 feet above the level of the sea, is covered by yellow brick clay, and overlies an untried bed of fine sea-sand. The shells and fragmens occur chiefly at the base of the gravel.

The most noticeable shells in this list of forty-two species, collected by Miss M. H. Farington, were *Panopœa norvegica*, *Mactra glauca*, *Cytherea chione*, *Cardium rusticum*, *Fusus propinquus*, and *Fusus antiquus*, var. *contrarius*. One specimen of a *Fusus*, doubtfully identified as *F. Fabricii* (*craticulatus*), had occurred.

The group was by no means characteristically Arctic or Glacial. It represented most nearly the Wexford lists, especially in presenting the reversed *Fusus*, and might be considered as connecting those beds with the Macclesfield drifts, also containing a Celtic assortment, with *Cytherea chione* and *Cardium rusticum*.

The author considered the Leyland deposit, like those on the west of the Derbyshire hills, to be more probably littoral and truly climatic than that of the Liverpool clays, the subject of Mr. Reade's Paper, and hazarded the conjecture that the latter were sea-bottom beds, into which, during some process of degradation and redistribution, the specimens found and enumerated by Mr. Reade had been carried down from the former more ancient retreating coast-lines.

Discussion.

Mr. Darbishire was not prepared to accept the view of the shells in the drift having existed on the spots where now found. He thought rather that the fragmentary remains might have been derived from the destruction of earlier beds deposited under somewhat different conditions. The occurrence at Wexford of nearly similar beds to those at Leyland pointed to a great destruction of an old sea-shore.

Mr. Gwyn Jeffreys thought that all the shells found in the Lancashire clays were just such as might have been thrown up on the shore, though the matrix in which they are found is not sandy. He thought the *Trophon* discovered was *T. truncatus* rather than *T. clathratus*. Neither was he quite satisfied that Miss Farington's *Fusus* or *Trophon* was really *T. Fabricii*. The occurrence of *Fusus*

*contrarius* did not surprise him, though that of *Mactra glauca* was very remarkable. He did not believe in the retiring or voluntary migration of mollusca, though they might be driven away by currents or want of food. He did not regard any of the shells as truly Arctic, and doubted whether any of them afforded clear evidence of climatal conditions.

Mr. Prestwich remarked on the progress which had been made in our knowledge of these shells since Sir P. Egerton had first called attention to the drift in which they occur. The number of perfect specimens from Leyland was he thought very striking. He had some difficulty in following Mr. Reade into the large theoretical questions into which he had entered, but pointed out that the striation of the surface of the country was significant of a period of intense cold, for which any alteration in the arrangement and proportions of land and water could hardly account. But in the overlying Boulder-clay the fragments of shells were all of species still existing in the neighbouring seas of the present day, and he did not think that at the time of its deposit the climate was of necessity intensely cold.

Prof. Hughes did not think that the deposits were in any way immediately connected with the Boulder-clay, to which they were long subsequent. He rather correlated them with the Hessle and Kelsey beds of the East coast. The deposits might in many cases have been formed on the shore of a sea which was eroding a cliff of Boulder-clay; and by this means there would be an admixture of the more recent shells with the redeposited boulders from the older clay. He submitted that the shells belonged to an age succeeding the true Glacial period. In the higher deposits there were still some traces of the more Arctic forms, while a more southern facies came over the fauna of the lower beds.

Mr. Charlesworth observed on the possibility of the transport of shells in the stomach of fishes. As to the comminuted condition of *Cyprina islandica*, he remarked that in the Crag beds these shells are nearly always much cracked, even when delicate shells in the neighbourhood are perfect.

The Chairman was glad that the old view as to the successive elevations and submergences during the Glacial period was not likely to be disturbed. As to the physical causes which conduced to the extreme cold, he did not undervalue the changes in physical geography; but if the astronomical causes, the existence of which seemed now to be fairly established, would have produced the effects, he did not see why they should be ignored even if the geographical causes might suffice. These latter seemed to be at best theoretical, whereas the former seemed mathematically necessary. He was not inclined to detach the shells from the clay, and thought that during the time of their deposit there were still glaciers on the higher points of the land. He did not agree with Prof. Hughes in regarding the beds with striated pebbles in the Vale of Clwyd as Post-glacial, and could not believe that in the case of the reconstruction

of the beds the striæ could be preserved and the pebbles not becomes mooth.

Mr. Reade, in reply, stated that his observations were intended to apply merely to the conditions under which the beds containing the shells had been deposited, and not to the period of extreme cold, for which he was quite willing to admit the potency of astronomical causes. He agreed with the Chairman in regarding the clay as a real Boulder-clay, the pebbles in it being for the most part scratched.

The following specimens were exhibited:—

Fossils illustrative of their papers; exhibited by Messrs. Reade and Darbishire.

Remains of *Hypsilophodon Foxii*; exhibited by Mr. Hulke in illustration of his paper.

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The next Meeting of the Society will be held on Wednesday, December 3rd, 1873, when the following communications will be read:—

1. "Notes on the Structure sometimes developed in Chalk." By H. G. Fordham, Esq., F.G.S.

2. "A short description of the Geology of the Eastern Province of the Colony of the Cape of Good Hope." By R. Pinchin, Esq., C.E. Communicated by H. W. Bristow, Esq., F.R.S., F.G.S.

3. "On the Mud-craters and geological structure of the Mekran Coast." By Lieut. A. W. Stiffe, F.R.A.S. Communicated by Prof. Ramsay, F.R.S., F.G.S.

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### LAURENTIAN.

1 Eözoön Canadense.

### CAMBRIAN AND SILURIAN.

2 Lingulella Davisii, Hymenocaris vermicauda, Orthis lenticularis,——Agnostus princeps, Olenus micrurus, Oldhamia antiqua,——Oldhamia radiata.

### LOWER SILURIAN.

3 Paradoxides Bohemicus.
4 Graptolithus, sp.; Maclurea Logani, Didymograpsus, sp.,——Orthis flabellulum, Orthoceras, sp.; Theca operculata,——Palæaster asperrimus, Echinosphærites Balticus,——Modiolopsis expansus, Holopea concinna, Lituites cornu-arietis.
5 Angelina Sedgwickii.
6 Ogygia Buchii.

### UPPER SILURIAN.

7 Euomphalus rugosus,——Atrypa reticularis, Spirifer plicatellus, Orthis rustica,——Pentamerus Knightii, Strophomena euglypha, Omphyma turbinata,——Modiolopsis complanata, Tentaculites ornatus, Cardiola fibrosa,——Hylasites catenularius.
8 Taxocrinus tuberculatus, Cyathocrinus goniodactylus, Ichthyocrinus pyriformis,——Pseudocrinus bifasciatus.
9 Phacops caudatus.
10 Calymene Blumenbachii.

### DEVONIAN.

11 Stringocephalus Burtini, Clymenia Sedgwickii, Murchisonia bilineata,——Megalodon cucullatus, Bronteus flabellifer, Uncites gryphus,——Calceola sandalina, Favosites polymorpha, Spirifer disjunctus.
12 Pterygotus.
13 Pterichthys, sp. Coccosteus.
14 Holoptychius Andersoni.
15 Cephalaspis Lyellii, Osteolepis, sp.
16 Adiantites Hibernicus, Anodonta Jukesii.

## CARBONIFEROUS LIMESTONE.

17 Woodocrinus expansus.
18 Actinocrinus, sp.; Cochliodus contortus (teeth), Macrocheilus, sp.,——Spirifer glaber, Euomphalus pentagonalis, Terebratula hastata. Productus punctatus. Phillipsia Derbiensis, Athyris Roissii,——Goniatites, sp.; Lithostrotion basaltiforme, Bellerophon, sp.

## COAL MEASURES.

19 Figure showing Section of Lepidodendron and leaf scars, Lepidodendron restored, Fructification of Lepidodendron (Lepidostrobus).
20 Stigmaria ficoides. Upright trunk of Sigillaria with stigmarian roots, Coal mine at St. Helen's, near Liverpool. Leaf scars of Sigillaria elegans.
21 Branch of Asterophyllites, Annularia and Sphenophyllum, Calamite restored, Fructification of Calamite (Volkmannia).
22 Cardiocarpum anomalum,——Fragment of Coniferous wood (Dadoxylon) fractured longitudinally, showing the bark, woody zone, pith and cast of hollow pith (Sternbergia). Cyclopteris, Trigonocarpum ovatum,——transverse Section of Dadoxylon, magnified, showing pith, woody fibre and medullary rays.
23 Pecopteris Serlii.
24 Aviculopecten papyraceus,——Zonites (Conularia) priscus, Spirorbis carbonarius, Pupa (Dendropupa) vetusta,——Anthracosia, sp.

## PERMIAN.

25 Productus horridus, Spirifer undulatus, Camarophoria crumena, Schizodus Schlotheimii,——Walchia penniformis.
26 Platysomus,——Palæoniscus.

## TRIAS.

27 Labyrinthodon restored and foot-prints. Coloured, 6s. 6d.
28 Labyrinthodon, section of tooth.

## TRIAS (Muschelkalk.)

29 Encrinus liliformis, Gervillia socialis,——Terebratula vulgaris,——Ceratites nodosus.

## LIAS.

30 Spiriferina Walcotti, Cardinia Listeri. Leptæna Moorei,——Gryphæa incurva,——Ammonites communis, Hippopodium ponderosum.
31 Ammonites bifrons.
32 Pentacrinus Briaræus.
33 Dapedius,——Hybodus (tooth). Hybodus (Ichthyodorulite). Acrodus (tooth),——Ophioderma Egertoni.
34 Plesiosaurus skeleton, restored.
35 Ichthyosaurus ,, ,,
36 Group of Reptiles, Ichthyosaurus, Plesiosaurus, Teleosaurus, and Pterodactylus. Coloured, 6s. 6d.

## LOWER OOLITE.

37 Pleurotomaria ornata, Trigonia costata,——Pterophyllum Comptum, Pholadomya fidicula, Nerinæa Goodhalii,——Purpuroidea Morrisii, Nucleolites clunicularis, Terebratula digona.
38 Ammonites Humphræsianus.
39 Jaw of Amphitherium Broderipii.
Do. Phascolotherium Bucklandii.

## MIDDLE OOLITE

40 Hemicidaris intermedia.
41 Trigonia clavellata, Cidaris florigemma,——Ammonites Jason, Belemnites hastatus, Gryphæa dilatata,——Thecosmilia annularis, Spine of Cidaris florigemma.
42 Apiocrinus rotundus, restored.

## UPPER OOLITE.

43 Cerithium Portlandicum, Ostrea deltoidea, Exogyra virgula,——Trigonia incurva, T. Gibbosa,——Isastræa Oblonga, Teeth of Pycnodus.
44 Archæopteryx macrura.
45 Pterodactylus crassirostris.

## WEALDEN.

46 Unio Valdensis,——Paludina elongata, P. fluviorum,——Cyrena media, Potamides carbonarius.

## NEOCOMIAN.

47 Corbis corrugata, Trigonia caudata,——Gervillia anceps,——Arca Raulini, Perna Mulleti.
48 Bones of the Maidstone Iguanodon.
49

## GAULT.

50 Solarium conoideum, Bellerophina minuta, Plicatula pectenoides,——Rostellaria carinata, Hamites rotundus, Ammonites lautus, ——Inoceramus sulcatus, Nucula ornatissima, Palæocoryster Stokesii.

## UPPER GREENSAND.

51 Terebrirostra lyra, Siphonia pyriformis, Exogyra columba——Salenia personata, Terebratula biplicata——Ammonites Rhotomagensis, Pecten quinquecostatus.

## CHALK.

52 Inoceramus mytiloides, Baculites anceps,——Turrilites costatus,——Ammonites varians, Scaphites equalis.
53 Beryx ornatus, restored.
54 Ananchytes ovatus.
55 Galerites albo-galerus.
56 Micraster cor-anguinum.
57 Marsupites ornatus, Goniaster, Spondylus spinosus,——Cyphosoma Konigii, Crania Parisiensis, Cidaris sceptrifera, Terebratula semiglobosa,——Spine of C. sceptrifera,——Do. C. clavigera.
58 Belemnitella mucronata, Bourgueticrinus ellipticus,——Otodus appendiculatus (tooth), Corax falcatus, tooth; Ptychodus depressus (tooth); Notidanus (tooth); Palatal teeth of Ptychodus decurrens.
59 Skull of Mosasaurus Hoffmani, from Maestricht.
60 Ventriculites, Cephalites, Choanites.

## THANET BEDS.

61 Cyprina Morrisii,——Thracia oblata, Panopæa intermedia,——Sanguinolaria Edwardsii, Glycimeris Rutupiensis,——Cucullæa crassatina, Pholadomya cuneata,——Astarte tenera.

## WOOLWICH and READING BEDS.

62 Cyrena cuneïformis, Melanopsis, Cerithium funatum, Pitharella Rickmani, Paludina sp. Melania inquinata,——Cyrena Dulwichiensis, Modiola Mitchelli, Cyrena tellinella,——Pectunculus terebratularis, Ostrea Bellovacina.

## LONDON CLAY.

63 Nucula Bowerbankii, Pinna affinis, Pectunculus decussatus,——Conus concinnus, Nautilus centralis, Cypræa oviformis,——Terebratulina striatula, Nautilus (Aturia) zic-zac. Pholadomya Dixoni.
64 Rostellaria lucida, Cryptodon angulatum, Pleurotoma acuminata,——Triton fasciatus, Aporrhais Sowerbyi,——Murex coronatus,——Voluta nodosa, Pyrula Smithii, Voluta denudata.
65 Wetherellia, Cucumites, Nipadites, Petrophilloides——Dromilites Lamarkii, Hoploparia Gammaroides, Xanthopsis Leachii,——Paracyathus caryophyllus, Teredina personata, Vermetus Bognoriensis,——Otodus (tooth), Ophiura Wetherellii, Myliobatis toliapicus.

### MIDDLE EOCENE.

66 Ancillaria fusiformis, Pleurotoma rostrata, Voluta athleta, Fusus porrectus, Seraphs fusiformis,——Murex asper, Conorbis dormitor, Dentalium striatum, Turritella multisulcata, Solarium plicatum.

67 Mitra scabra, Typhis pungens,——Cancellaria evulsa, Fusus longævus, Strombus Bartonensis,——Oliva Branderi, Voluta ambigua,——Rostellaria rimosa, Triton argutus.

68 Cardita sulcata, Phorus agglutinans, Crassatella sulcata,——Cassis ambigua, Cardita planicosta, Natica ambulacrum,——Ostrea flabellula, Pectunculus deletus, Chama squamosa.

### UPPER AND MIDDLE EOCENE.

69 Planorbis cuomphalus,——Limnæa longiscata, Bulimus ellipticus, Limnæa fusiformis,——L. maximus, Glandina costellata, Paludina angulosa.

### MIOCENE.

70 Skull of Dinotherium giganteum.

### CORALLINE CRAG.

71 Astarte Omalii, Terebratula grandis,——Cassidaria bicatenata, Voluta Lambertii, Pyrula reticulata,——Cardita senilis, Cyprina rustica.

### RED CRAG.

72 Pectunculus glycimeris, Mactra arcuata,——Columbella sulcata,——Nassa reticosa, Fusus contrarius, Cypræa Europea, Buccinopsis Dalei, Purpura tetragona,——Tellina obliqua, Natica hemiclausa, Pecten opercularis.

### GLACIAL BEDS.

73 Cyprina Islandica, Panopæa Norvegica,——Trochus cinerarius, Scalaria Grœnlandica, Trophon clathratum, Natica clausa, Trichotropis Borealis,——Astarte elliptica, Pecten Islandicus, Tellina calcarea, ——Venerupis irus, Astarte Borealis, Leda oblonga.

### POST PLIOCENE.

74 Skeleton of Mammoth (Elephas primigenius).
75 Skeleton of Megatherium Americanum.
76 Skeleton of Dinornis.
77 Skeleton of Mastodon and tooth of ditto.

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## SECTIONS, &c.

1 **TABULAR VIEW OF THE STRATIFIED ROCKS.** Coloured, 3s. 6d.

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3 **FAULT NEAR STANTON HAROLD, DERBYSHIRE.**

B, Carboniferous limestone; BB, Limestone shale: C, Millstone grit; D, Coal measures; DD, Coal seam. Shaft of Heath End Colliery.

**SECTION ACROSS THE BRISTOL COAL FIELD.**

A, Old Red sandstone; B, Carboniferous limestone; C, Millstone grit; D, Coal measures. 1, New Red marl, resting unconformably upon the denuded edges of the Palæozoic formations; 2, 3, and 4, Lower, Middle, and Upper Lias; 5, Lower Oolite. Coloured, 4s. 6d.

*Additional Sections and Groups of Fossils are in preparation,*